

PREFACE

The Weinstein transform is a generalization of Fourier and Hankel transforms which kernel consists of a complex exponential function and a normalized Bessel function of the first kind. The Weinstein transform has a rich calculus and can be applied in many areas of mathematical sciences. Pseudo-differential operators are the generalization of partial differential operators and it played a significant role in the problems of partial differential equations, numerical analysis and quantum physics. This thesis contains six chapters. In this thesis, many aspects are discussed of pseudo-differential operators involving the Weinstein transform and obtained various results. The organization of the thesis is as follows:

Chapter 1 is introductory which provides brief description and historical background about pseudo-differential operators involving Weinstein transform. In this chapter related subsequent information of other chapters like definitions, properties and motivations of Fourier transform, Hankel transform, Weinstein transform and pseudo-differential operators are given by the author.

In Chapter 2, pseudo-differential operators involving the Weinstein transform are introduced and discussed the continuity property and an integral representation of pseudo-differential operators involving the Weinstein transform on Schwartz space $S_*(\mathbb{R}_+^{n+1})$. Using the aforesaid theory boundedness of pseudo-differential operators on weighted L^p - type Sobolev space $L_{\alpha,s}^p(\mathbb{R}_+^{n+1})$ and other properties are established. With the help of this theory an application of pseudo-differential operators in heat equation involving Weinstein transform is given.

In Chapter 3, various properties of pseudo-differential operators $\mathcal{P}(x, D)$ and $\mathcal{Q}(x, D)$

associated with the homogeneous class of symbol are given by exploiting the Weinstein transform. Product of symbols and commutators of two pseudo-differential operators are given and some results related to commutators of two pseudo-differential operators on weighted L^2 - type Sobolev space are proven.

In Chapter 4, the $L_\alpha^p(\mathbb{R}_+^{n+1})$ - boundedness of pseudo-differential operators associated with a class of symbol S^0 are discussed by exploiting the theory of the Weinstein transform.

In Chapter 5, boundedness and compactness results for the symmetrically global pseudo-differential operator on $L_\alpha^p(\mathbb{R}_+^{n+1})$ - type Sobolev spaces $H_\alpha^{r,s,p}$ of order (r, s) are investigated by exploiting the theory of the Weinstein transform. Using the symmetrically global symbol various properties of minimal-maximal pseudo-differential operators involving the Weinstein transform are discussed. By taking the aforesaid theory, the weak solution of the symmetrically global pseudo-differential equation is obtained.

Chapter 6 describes the composition of two pseudo-differential operators $\mathcal{A}_a(x, D)$ and $\mathcal{B}_b(y, D)$ associated with symbols $a(x, \xi)$ and $b(y, \eta)$ in the symbol class S^m by exploiting the theory of the Weinstein transform. Some results of pseudo-differential operators in Sobolev type space $\mathcal{H}_\alpha^{0,1}$ are obtained and $L_\alpha^1(\mathbb{R}_+^{n+1})$ - boundedness of the solution of heat equation is found by utilizing the theory of the Weinstein transform.